March 1885

Notes on the Habits of some Australian Hymenoptera Aculeata.

By HENRY LING ROTH. (Communicated by Sir J. LUBBOCK, Bart., Pres. Linn. Soc.)

[Read 20th November, 1884.]

[MR. ROTH has recently transmitted to the British Museum, through Sir John Lubbock, a series of Ants and other Hymenoptera from Mackay, Queensland. By Mr. Roth's desire, I have selected such of his accompanying observations as appear to be of sufficient interest for publication, and have added the correct names of the species. I have also described a species of *Rhynchium* which seems to be new.—W. F. KIRBY.]

FOSSORES.

SPHEGIDÆ.

PELOPÆUS LÆTUS, *Smith.*

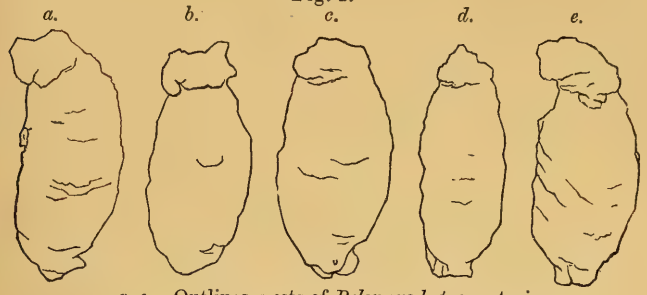
These Wasps are exceedingly common. When living in the country, it is very difficult to keep them out of the house. They build their nests anywhere and everywhere—on the walls, ceilings, on the legs of chairs, under the table, in crevices, cupboards, in vases, between pictures and the walls, in the roof, once in a pipe (12th Nov. 1883), and even on curtains.

They construct their nests very differently from *Eumenes Latreillii* (*vide infrà*, p. 321). Having chosen a desirable spot, they go in search of the necessary mud. This they obtain from the moist or wet soil on the margin of creeks or puddles. Having scraped enough particles together and made them up into a ball about the size of their thorax, they carry it away and begin building. The marks of the layers of mud are very distinctly visible. When the site chosen is not a very good one, as for instance between a picture and the wall, these cells are sometimes flattened out in course of construction as shown in the accompanying figs. 1 *a*–1 *e*. I may here remark that the layers of mud are not very distinctly shown in this figure, in consequence of the wasp having been unable to obtain sufficiently dry mud, owing to the prevailing wet weather, and the layers therefore run into one another. When the mud is very wet the wasp drops a quantity, and the ground below which she is building is frequently covered with the fallen particles.

In her flight she stridulates very like a bee, but with a much deeper tone. As soon, however, as she has settled to work either in collecting mud or in the actual construction of her nest, she

produces quite a different sound. It has now an exceedingly high pitch; and from my observations of the wasp at work, I believe it is the result of the vertical motion of the abdomen from the pedicle.

Fig. 1.



a–e. Outlines, nests of *Pelopæus lætus*, nat. size.

The work which the wasp undertakes in building her nest may be judged from the number of times she takes to go to and from the wet earth. On Oct. 13, 1883, I timed a wasp at her work. In the course of 22 minutes she fetched mud at a distance of 5 yards; 13 times at the following intervals—at $14\frac{1}{2}$, $12\frac{1}{2}$, $10\frac{3}{4}$, $9\frac{1}{4}$, $7\frac{1}{2}$, $6\frac{3}{4}$, 4, $1\frac{3}{4}$ minutes to 3 o'clock in the afternoon; then at 3 P.M., 1, $3\frac{1}{2}$, $5\frac{1}{2}$, $7\frac{1}{4}$ minutes past 3, when I ceased my observations.

When one cell is completed the wasp goes in search of spiders, of which she generally collects from 15 to 22 specimens of three moderate-sized species. It is very seldom that any other species of spiders are collected. She takes them one by one and packs them half dead in the cell, being very particular as to the way in which they fit in. When the cell is full she deposits an egg, somewhat smaller than that of *Eumenes Latreillii*, and the egg is laid on one of the benumbed spiders. She then closes the top of the cell with mud and commences a fresh cell at its side. She builds the cells in a row side by side, but the row is seldom straight, and she lacks that exactitude and neatness which characterizes the work of *Eumenes*. Sometimes, if disturbed, she will close a cell without putting in any spiders at all, and at other times she will only half fill the cell. The cell-wall attains a thickness of $\frac{3}{8}$ inch. The wasp constructs from 10 to 20 of these cells in two rows one above the other, fills the interstices between the cells with mud, and smears the whole over with mud likewise, until it resembles a long lump of clay, and at this stage the nest is undistinguishable in outward appearance from that of the *Eumenes*. But if allowed to continue her work

undisturbed, she goes a step further, and by means of diagonal streaks of mud gives the nest the look of a small piece of the bark of the common European Acacia. When laying on the mud, either at the very commencement or at the end, she works it by placing it on the required spot and then drawing it backwards towards herself, after which she runs to and fro over it, thus giving it the right shape.

When the spiders are all consumed the larva pours out of its mouth a dark yellow transparent material, which forms a shell around it, and looks much like gold-beaters'-skin; at the bottom of this shell is a hard black lump, and outside the shell are found the juiceless bodies of the spiders. There is no lining to the cell. Between this shell and the cell-wall a little fluff is formed, and this keeps the former in its position.

When the perfect insect is developed (it is not doubled up in its cell) it breaks through, and after cleaning itself flies away without any preliminary canter. I have not noticed whether on emerging the little drop of liquid is produced.

These wasps are terribly infested by Dipterous and other parasites, some of which appear to destroy the larvæ indirectly by consuming the prepared food (the spiders). With the flies the case is somewhat peculiar, as the mother insect appears to follow the wasp when she is carrying a spider, and deposits her egg on the food originally intended for the offspring of the wasp. I once found two and once five (Nov. 14, 1883) cocoons of these flies. In course of development the larvæ of these flies may be seen thriving on the spiders in the same way as the larvæ of the wasp; but as they devour the juice of the spiders very quickly no food is left for the wasp's larvæ, which, being unprepared at that stage to develop into pupæ, naturally die, and the mildewed remains of their bodies are found in the cell after their fully developed enemies have quitted it.

Another parasite appears to commence its attack on the insect itself in one of its more advanced stages. On one occasion I obtained three specimens of this parasite in its pupa-state. I found the pupæ inside the above-mentioned gold-beaters'-skin-like shell, so that the egg must have been deposited through the mud-wall and shell on to the young wasp either whilst changing from the larval to the pupal state or when it had already been transformed into a pupa. The pupæ of these parasites are extremely lively.

Sphex ephippium, *Sm.*

These are underground builders. One which I observed on Nov. 4, 1883, emerged and brought up earth 15 times in the course of 11 minutes. I once saw one pounce upon an insect which I took for a cricket. They cover up the opening of their nest every night when their labours are done. They are not particular as to site, sometimes mining under a shrub in loose garden soil, at others in the hardened ground of a well-trodden, but not gravelled footpath.

Larridæ.

Pison Spinolæ, *Shuck.*, and perplexus, *Smith.*

The nests are exceedingly brittle, and are apparently formed of small particles of loose dry earth stuck together by some gummy fluid secreted by the wasps. They fill their nests exclusively with small spiders, and the larva makes itself a dull grey brittle shell in the cell. [The specimens to which this observation applies appear to represent two species; both probably have similar habits.—W. F. K.]

Bembicidæ.

Bembex tridentifer, *Sm.*

These build underground nests.

Diploptera.

Eumenes Latreillii, *Sauss.*

Towards the end of last year (1883) I had an opportunity of observing how these wasps build their nests, at Mackay, Queensland.

As to the choice of position of the nest I was unable to find out what the wasps preferred. The only nests I discovered were in out-houses on perpendicular walls sometimes high, sometimes low, and the presence of man (or bees or other insects) did not disturb them in the least while building. On one occasion I found a wasp building on a door of a shed which was in constant use.

When the wasp has chosen the spot on which she intends to build, she goes in search of water (either stagnant or running), but the particular one which I observed obtained water from the trickling overflow of a leaking pipe. She goes to the water and drinks or rather takes in a supply, and then flies to a clod of not very hard clay-loam. With her mandibles and first pair of legs she scrapes up small particles of the clay, discharging water during

the process. Before long she has made up a little mud-ball about the size of her thorax. This she carries to the chosen site, and commences work by making a little curved wall of mud as the basis of the cell. She then goes back to the water and commences afresh. The distance from the water to the clod was about 12 yards, and from the clod to the site about 4 yards, and it took her from 4 to 7 minutes to get her material, and she would then work from 1 to $2\frac{1}{2}$ minutes. She appeared to have no difficulty in finding her way between the three spots, but occasionally she would try another clod; generally, however, she would come back to the original clod, which had a large and conspicuous moist mark.

Fig. 2, A and B, drawn to scale, gives very accurately the size of the cell as viewed from the side and above; also the various layers of mud as they were deposited, and which are distinctly visible to the last. When the cell was ready the wasp went in search of a common green caterpillar which infested all our vegetables, and put three of these (each about an inch long) into the cell.

Fig. 2.

Nest of *Eumenes Latreillii*.—A, upper view; B, side view.

She carries these by the head, holding them with her mandibles and fore legs, and allows the rest of the body of the caterpillar to hang down in a line with her other long legs. She is very particular in packing the caterpillars nicely round the inside of the cell, and, if dissatisfied with her arrangements, she will occasionally take one out and adjust it afresh. When this is done to her entire satisfaction, she deposits one oblong light yellow semi-transparent egg, which is always hung by a light silken thread from the uppermost inside surface of a cell, whatever may be the cell's position. This done, she closes up the orifice with the usual mud, and commences a fresh cell by the side of the completed one. She continues thus daily building the cells, side by side, until she has completed about seven or eight, all in one straight row. She then constructs three or four, side by side, on the top of the first row; and, these being finished, she daubs the whole

over with mud, ultimately giving it the appearance of an oblong lump of clay stuck on the wall, for by well smearing the mud she leaves nothing whatever to indicate the existence of the cells hidden underneath.

This wasp began to build on the 12th of September and finished on the 23rd of the same month, during which period she had completed a nest of ten cells. On the 3rd of November I slightly opened a cell which had been closed on the 20th of September, and found a wasp struggling inside. On the 8th of November I opened some other cells, and found several dead larvæ and pupæ which had been destroyed by parasites.

The cells are furnished with a silvery silk lining, with hardly any space between the lining and the cell-wall. This lining is fixed to the cell by fibres of a woolly appearance. In one corner of a cell, between the lining and the cell-wall, I found what appeared to be the cast-off skin of the larva, and excrements, as well as the skins of the caterpillars which had been devoured.

The wasps do not all emerge from the same side, some coming out at one end of the cell and some at the opposite end.

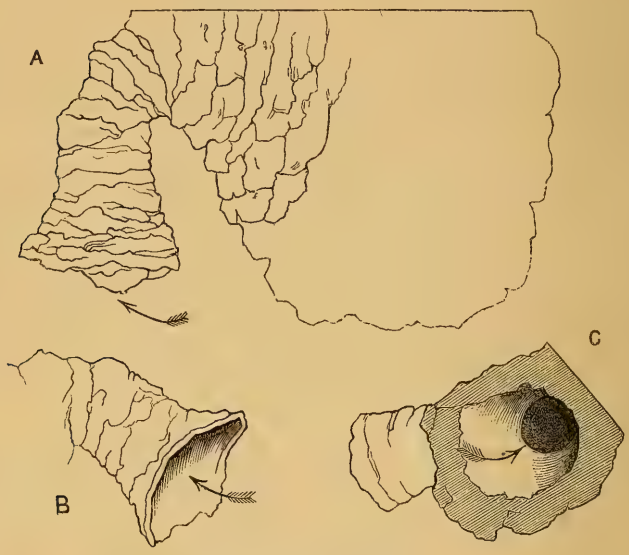
On the 10th of November the wings of the wasp whose cell I had opened had grown to their full length, and on the 12th of November I let her out. She was doubled up, her abdomen being under her thorax, and she was working with her jaws, fore legs, and antennæ, but there seemed to be no room for her to use her other legs. In the corner of the cell, inside the lining, was another cast-off skin. On the same day (November 12) a wasp emerged from a cell closed on the 22nd of September, so that it would appear that it takes fifty-one days for the development of the wasp from the time the egg is laid until the wasp appears as a fully formed imago. Both the wasps on emerging emitted a few drops of a colourless fluid like water, and, strange to say, it appeared to me that this came from the thorax. Both wasps commenced to clean themselves as soon as they emerged, and then prepared to fly away, when I captured them.

Abispa splendida, *Guér.*

I found five specimens of these, which I took out of the nest. The larva and pupa develop without forming any shell. When the female has finished her nest she blocks up the entrance, but whether she destroys the approach or not I am unable to say. Each larva has a cell to itself.

[A short account of the nest of *Abispa ephippium*, Fabr., was published by Smith and Ker, Trans. Ent. Soc. Lond. (2) i. pp. 180, 181 (1850).—W. F. K.]

Fig. 3.



Nest of *Abispa splendida*.

A. Side view, nat. size. B. Outer opening. C. Section showing the inner opening as indicated towards the point of the arrow.

Rhynchium Rothi, sp. n.

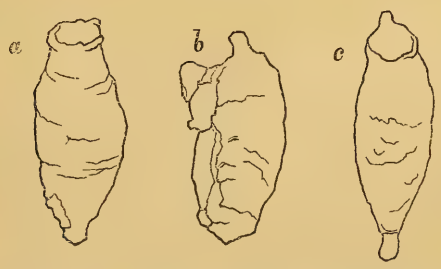
[Exp. al. 13–14 lin.

Female. Black; antennæ reddish, scape paler, bright yellow beneath. Head black; clypeus very finely punctured, wholly yellow, slightly angulated at the sides, rather longer than broad, and bifid at the extremity; base of the mandibles with a slight orange streak; hinder orbits and inner orbits from the clypeus to the depth of the emargination rather narrowly bordered with yellow, the intermediate orbits on the borders of the vertex very slightly marked with orange; vertex and thorax rather coarsely punctured; between the antennæ is a nearly equilateral yellow triangle, and two small oblique orange streaks lie between the two hinder ocelli and the front ocellus. Prothorax entirely yellow above; a small orange dot in front of the base of the

wings; scapulæ black; meso- and metathorax black, the latter with three small spines at the lower angles. Abdomen black, the first segment narrowly, and all the others rather broadly, edged with orange above, and, except the first, narrowly below; the subterminal segment is more broadly bordered with orange beneath; and the terminal segment is entirely orange above, except at the base, and black, with a narrow yellowish rim, below; the orange border of the second segment projects forward on each side above, but the other borders are not perceptibly waved. Front legs reddish; femora black at the base, and with a yellow stripe at the tip beneath; four hind legs red, the greater part of the femora, the tips of the hind tibiæ, and the basal joints of all the tarsi black above. Wings yellowish hyaline, smoky towards the extremity; subcostal nervure blackish, especially at the base.

Male. The light markings of a much deeper colour, of an orange-yellow; clypeus (which is semicircularly emarginate at tip), labrum, and mandibles (except the tips, which are blackish) orange-yellow; upper part of the head almost entirely black; an orange-yellow mark, like a dumbbell, between the antennæ; orbits, from the clypeus to the depth of the emargination, narrowly reddish; cheeks behind the eyes entirely reddish on their lower portion, but this colour rapidly narrows, and ceases entirely at two thirds of the height of the hinder orbits. Prothorax and legs almost entirely reddish orange, the four hinder coxæ only being slightly marked with blackish; on the sides of the prothorax are two reddish spots and a streak, the uppermost and smallest of the spots being in front of the base of the fore wings.

Fig. 4.



a–c. Outlines, nests of *Rhynchium Rothi*, of natural size, and showing the irregularities in shape of nests made by the individual insect.

Metathorax very strongly keeled behind; sides orange, with a very strong obtuse projection. Basal segment of abdomen black at the base, red in the middle, and orange behind, the two latter colours not very sharply defined; a dusky line on the middle above, and a short dusky dash on each side above, near the extremity; the reddish-orange border of the second segment with a small black line in front in the middle, and a slight dusky mark on each side above; the borders of the remaining segments rather more extended than in the female, especially on the under surface. Subcostal nervure of wings not blackish, and tips of the wings less dusky than in the female.

Resembles *Rhynchium mirabile* and *R. superbum*, Sauss., but differs from both in the colour and shape of the clypeus. An unnamed specimen from Torres Straits, in the British Museum, appears to be a slight variety of the female, differing from Mr. Roth's specimen by its darker legs, and in some minute details of coloration on the head and abdomen.—W. F. K.]

The specimens herewith are, I believe, generally supposed to be distinct species, but as I have found them in the same nests, I am inclined to think that they are simply male and female. I believe these insects build nests like those of *Pelopæus lætus* (see fig. 1, p. 319). The cell is provided with a brown silky lining, in which the larva becomes developed. When the larva has shed its skin, the wings develop first, the eyes then gradually turn black, the abdominal bands turn dark as well as the thorax; finally, the legs and antennæ become more defined, and the insect emerges fully developed.

ODYNERUS BICOLOR, *Sauss.*

These insects make use of forsaken nests of *Pelopæus lætus*, Sm.

VESPIDÆ.

POLISTES BERNARDII, *Le Guillon.*

These wasps build paper-like nests, suspended by a black stalk, and without any envelope. They feed their larvæ with a peculiar light yellow substance, which they collect in large lumps. A wasp, on arriving at the nest, shares this with the other wasps, who immediately set to work to feed their progeny. It is very droll to see the larvæ put forth their heads and greedily devour the food offered them.

Heterogyna.

Formicidæ.

Formica rufonigra, *Lowne.*

These ants are very numerous and destructive at Mackay, Queensland, and attack anything and everything that comes in their way. They are not even afraid of the large species of *Camponotus*, some of which, when attacked, remain perfectly still, with a firm grip on the ground; but this passive resistance avails them nothing, for they are mercilessly dragged off all the same.

A tree in my garden (Chinese date-plum ?) was infested to a great extent by green caterpillars, which appeared to feed at night-time, resting during the day under a web spun across a leaf. These ants discovered the tree, and cleared it of the caterpillars. Although they would sometimes enter the web to inspect it, they never attacked the caterpillar without first destroying the web, when they would bite the caterpillar till it wriggled out and fell among the ants below, who carried it off. These ants had numerous holes, communicating by pathways above ground, if not by subterranean galleries also, throughout the garden. They are one of the most abundant species of ant; and when alive are of a much blacker colour than when they have been preserved in spirit. They also milk the "waxy white louse" (pou à poche blanche) which infests the sugar-cane.

Œcophylla virescens, *Fabr.*

They take possession of whole trees, gumming up the leaves for their nests with a white semitransparent sort of paper. They rob beehives, not for the honey, but for the bees themselves. They go to the hive and attack the bees on their arrival. The latter have no chance against the numbers of the ants, and are stung to death and carried triumphantly off to the nests. These ants are very fearless and bold in attacking any one, and are armed with a very painful sting. I have seen them attack a *Curculio*, but the latter remained perfectly still till the ants left it, probably supposing that it was dead or unfit for food. If any one approaches a tree on which these ants are resting, they raise the front part of the body in a menacing manner. They are found on various trees, *Eucalyptus*, orange, &c., at Mackay, Queensland.

[Jerdon (Ann. & Mag. Nat. Hist. (2) xiii. pp. 104, 105—1854) gives a similar account of the nests of the allied Indian ant, *Œ. smaragdina*, Fabr., and says that although they feed chiefly on vegetable secretions, they are sometimes employed to destroy a nest of wasps that may have established themselves in a house. He does not speak of their attacking bees.—W. F. K.]

PONERIDÆ.

ECTATOMMA DIMINUTA, *Smith.*

These marauding ants from Cairns, Queensland, appear to have no settled home, but roam about in masses, sometimes together and sometimes separating into small companies. They attack any insect they meet with, hunting their victims from under the bark of dead trees or out of crevices. Nothing comes amiss to them, and no insect appears to escape them.

CRYPTOCERIDÆ.

MERANOPLUS DIMIDIATUS, *Sm.*

These harvesting ants are found at Mackay, Queensland. They climb up grasses, and carry away the seed to their nests. The ground near the nest is generally strewn all over with the husks they have brought to the surface.

Ornithological Notes.

By THOMAS EDWARD GUNN, F.L.S.

[Read 15th January, 1885.]

Occurrence of the Blue-throated Warbler on the Norfolk Coast.—During the past four autumn seasons Mr. G. E. Power has been fortunate in procuring specimens of this hitherto rare British species at Cley on the Norfolk coast. In the second week of September last (1884), the Blue-throated Warbler apparently arrived in larger numbers than usual, so that Mr. Power had a chance of securing a good series for his collection; he having sent me a dozen examples to preserve, afforded me an opportunity of making a few observations, which I now append.

The relative lengths of the bills and tarsus in the above, with one exception, varied so slightly as to be scarcely perceptible,